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DETECTION OF INCREASED LEFT VENTRICULAR FILLING PRESSURE BY CARDIOVASCULAR MAGNETIC RESONANCE

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Background: The objectives of this study was to evaluate left atrial contraction contribution(AC) to left ventricular(LV) filling in normal and diseased hearts by cardiovascular magnetic resonance(CMR) volumetry and to find if it has a correlation with left vetntricular filling pressure as assessed by Doppler echocardiography.

Methods: Normal subjects (no history of cardiovascular disease and had normal Echocardiography) and patients with impaired LV ejection fraction(LVEF< 50%) underwent steady-state free precession CMR with retrospective ECG gating covering the whole cardiac cycle by 25 phases. AC% was calculated as the difference between LV volume before atrial contraction(V1) and LV end diastolic volume(V2) divided by LV stroke volume(LVSV). Volumes were from 6 rotational long axis views. All subjects had a Doppler echocardiography assessment of mitral valve inflow and a tissue Doppler study of mitral annulus where E/Ea ratio was calculated. LV filling pressure was defined as normal when E/Ea < 8 and elevated when E/Ea > 15. CMR studies were reviewed by two readers who were blinded to the Doppler studies and patient's age and clinical data. Intraobserver and interobserver variability was assessed.

Results: 140 studies were analyzed. Normal subjects were 110(60 males and 50 females). Patients were 30(16 males and 14 females). Means of differences in V1, V2, LVSV between the two CMR readers were 4.3±3, 2.5±2 and 5.5±4, respectively. AC in normal subjects was 20% ± 5, 35%± 5, 50%± 5 for subjects <35, 35-60 and >60 years, respectively. Patients with LVEF < 45 and E/Ea < 8 had AC similar to normal subjects. AC was found to be reduced in patients with E/Ea > 15. When AC adjusted for the age, i.e.[(V2-V1)/LVSV]/age , 93% of patients with E/Ea > 15 had a value less than 0.5 and all subjects with E/Ea < 8 had a value higher than 0.5.

Conclusions: The contribution of left atrial contraction to LV filling is highly dependent on age and varies between 20% (age <35) and 55% (age >60). CMR assessment of left atrial contribution can detect decreased contribution of the atrial kick as a marker of increased LV filling pressure with excellent sensitivity and specificity.